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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/822,950	03/30/2001	Andrew J. Thurston	CIS0069US	6592

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CAMPBELL STEPHENSON ASCOLESE, LLP
4807 SPICEWOOD SPRINGS RD.
BLDG. 4, SUITE 201
AUSTIN, TX 78759

EXAMINER	
GANDHI, DIPAKKUMAR B	
ART UNIT	**PAPER NUMBER**
2117	

MAIL DATE	DELIVERY MODE
07/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/822,950	THURSTON, ANDREW J.	
	Examiner	Art Unit	
	Dipakkumar Gandhi	2117	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) *30* is/are withdrawn from consideration.

5)☒ Claim(s) *38-47* is/are allowed.

6)☒ Claim(s) *1-8,10-29,31-37 and 48-55* is/are rejected.

7)☒ Claim(s) *9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Amendment

1. Applicant's request for reconsideration filed on 04/30/2007 has been reviewed.

2. Amendment filed on 04/30/2007 including amended claims has been entered.

3. Applicant's arguments filed on 04/30/2007 have been fully considered but they are not persuasive.

4. As per claims 1, 25 the applicant contends that the cited art fails to teach or suggest "extracting an error polynomial from the data signal, wherein the extracting comprises generating a plurality of minimum-degree polynomials based on no more than six equations."

The examiner disagrees and would like to point out that Kraft teaches that it is the function of an error correcting code to repair or fix data bits that are corrupted by transmission over a communications channel without using any reference to the original transmitted data other than what is received.

This is many times accomplished by breaking the data into blocks, and then inserting extra parity or check bits into each block according to a mathematical scheme; such codes are called block codes.

Binary BCH codes are one type of block codes. The method of coding a BCH block or codeword consists of dividing the binary polynomial represented by the data bits in the block by a special polynomial known as the generator polynomial of the code. The method of decoding a BCH code consists of three distinct steps: 1) computing a vector known as the syndrome vector; 2) determining an error-location polynomial from the syndrome vector; 3) finding the roots of the error-location polynomial, which represent the locations of the errors. The actual repair or fixing of the erroneous bits for a binary BCH code is then simply a matter of changing them to the opposite binary value i.e. one to zero, etc. (col. 1, lines 16-36, Kraft).

Kraft also teaches that for a three-error correcting BCH code, there are six components of the syndrome vector S1, S2, ...,S6. Each of these is a Galois Field quantity (col. 1, lines 60-63, Kraft).

Wicker teaches t-error-correcting BCH code. Wicker also teaches that $\{X_l\}$ are error locators, for their values indicate the positions of the errors in the received word. We obtain a sequence of 2t algebraic syndrome equations in the v unknown error locations, $S_1, S_2, S_3, S_4, \ldots S_{2t}$ (page 204, Wicker). The

examiner would like to point out that for 3-error-correcting BCH code, there are six algebraic syndrome equations.

Baggen teaches that the error detecting and correcting properties are determined by the factors of the generator polynomial, i.e., in our case

$g(x)=m_0(x)m_1(x)m_3(x)\ldots,$

where each factor $m_i(x)$ is itself a polynomial. The factors themselves may be minimal (col. 4, lines 60-67, Baggen).

5. As per claims 1, 25 the applicant also contends that the cited portions of Kraft, both alone and in combination with the other references, do not teach or suggest "generating a plurality of minimum-degree polynomials...using no more than two branch decisions."

The examiner disagrees and would like to point out that Kraft teaches that referring to FIG. 1, it can be seen that the syndrome vector 2 is applied to input port means 1. Calculation means 4 and decision means 5 provide a circuit for traversing a binary tree (i.e. using no more than two branch decisions). Calculation means 4 provides the set of tree decision variables 5 used by the decision means to traverse the binary tree. Polynomial generator circuit 8 presents the three non-trivial coefficients of the error-location polynomial 9 to output port 10 (fig. 1, 2, col. 7, lines 8-9, lines 15-19, lines 24-26, Kraft).

Kraft teaches that the binary tree of FIG. 2 represents the essence of the invention and is traversed by decision means 6 of FIG. 1. The traversal of this decision tree leads to the correct coefficients of the error-location polynomial for the current received code vector (fig. 1, 2, col. 6, lines 2-7, Kraft).

6. As per claim 13, the applicant contends that the cited art fails to teach or suggest "feeding the syndromes to a plurality of Galois field multiply accumulators; and calculating a plurality of minimum-degree polynomials associated with the BCH code, using the Galois field multiply accumulators."

The examiner disagrees and would like to point out that Oh et al. teach that in the Berlekamp-Massey algorithm, the error locator polynomial is obtained by an iterative method. Specifically, the error locator polynomial is updated based on the syndrome values on each iteration. In order to calculate the coefficients of the error locator polynomial, various variables, e.g., correction terms, discrepancy, etc., are introduced. The multipliers are used to update the variables and the error locator polynomial on each

iteration. For a t-error correcting Reed-Solomon coder 6t multipliers are needed in calculating the error locator polynomial using the Berlekamp-Massey algorithm, wherein t represents the error correcting capability of the code. The syndrome values are inputted every 2 symbol clock cycles to be used in calculating the error locator polynomial. In other words, it takes two clock cycles in carrying out each iteration (col. 2, lines 11-25, Oh et al.).

Baggen teaches that the error detecting and correcting properties are determined by the factors of the generator polynomial, i.e., in our case

$g(x)=m_0(x)m_1(x)m_3(x)\ldots,$

where each factor $m_i(x)$ is itself a polynomial. The factors themselves may be minimal (col. 4, lines 60-67, Baggen).

7. As per claim 48, the applicant contends that none of the teachings of Kraft cited above appear to contain any teaching or suggestion to generate an error polynomial based on a plurality of minimum-degree equations.

The examiner would like to point out that Baggen teaches that the error detecting and correcting properties are determined by the factors of the generator polynomial, i.e., in our case

$g(x)=m_0(x)m_1(x)m_3(x)\ldots,$

where each factor $m_i(x)$ is itself a polynomial. The factors themselves may be minimal (col. 4, lines 60-67, Baggen).

8. In response to applicant's argument that there is no suggestion to combine the references Kraft (non-iterative technique) and Baggen (minimum-degree polynomials) in claim 48, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Kraft reference relates to a fast error correction circuit for binary BCH codes capable of correcting up to three errors (col. 1, lines 9-11, Kraft). Baggen teaches a decoder for decoding such as extended communication signal (col. 3, lines 54-55, Baggen). Baggen

teaches that the invention is applicable to BCH codes that have a factorizable polynomial (col. 4, lines 26-27, Baggen). Baggen teaches that BCH codes are cyclic codes, and they are characterized by the fact that each code word c(x) is a multiple of a generator polynomial g(x). This fact is used for encoding and decoding BCH codes. For instance, in checking a CRC, the received word r(x) is fed through a feedback shift register, which in mathematical terms is equivalent to dividing (in the Galois Field GF(2)) the received word by the polynomial that is represented by the feedback connections of the feedback shift register. If the remainder is zero (CRC=OK), the received word is a multiple of g(x): r(x) mod g(x)=0, i.e., the received word belongs to the code. If the remainder is not zero, an error is detected. Depending on the properties of the code, errors can be corrected by applying mathematical operations to this remainder (col. 4, lines 44-60, Baggen). Thus, Kraft and Baggen references can be combined to teach the limitations in claim 48.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claim 1-6, 10, 11, 12, 13, 14, 15, 17, 18, 24, 25, 26, 31, 32, 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (US 5,583,499) in view of Kraft (US 5,343,481), Baggen (US

5,539,755) and Wicker (Error Control Systems for Digital Communication and Storage, 1995, Prentice-Hall, Inc., Page 204). Please see the office action mailed on 01/29/2007 for details.

12. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (US 5,583,499), Kraft (US 5,343,481), Baggen (US 5,539,755) and Wicker (Error Control Systems for Digital Communication and Storage, 1995, Prentice-Hall, Inc., Page 204) as applied to claim 1 above, and further in view of Erhart et al. (US 5,051,999). Please see the office action mailed on 01/29/2007 for details.

13. Claims 8, 16, 19, 20, 21, 22, 23, 27, 28, 29, 33, 34, 35, 36, 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al. (US 5,583,499), Kraft (US 5,343,481), Baggen (US 5,539,755) and Wicker (Error Control Systems for Digital Communication and Storage, 1995, Prentice-Hall, Inc., Page 204) as applied to claim 1, 13, 25 above, and further in view of Stenerson (US 4,597,083). Please see the office action mailed on 01/29/2007 for details.

14. Claims 48, 49, 50, 51, 52, 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez et al. (US 2002/0165962 A1) in view of Kraft (US 5,343,481) and Baggen (US 5,539,755). Please see the office action mailed on 01/29/2007 for details.

15. Claim 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez et al. (US 2002/0165962 A1), Kraft (US 5,343,481) and Baggen (US 5,539,755) as applied to claim 48 above, and further in view of Wicker (Error Control Systems for Digital Communication and Storage, 1995, Prentice-Hall, Inc.). Please see the office action mailed on 01/29/2007 for details.

Allowable Subject Matter

16. Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Please see the office action mailed on 01/29/2007 for a statement of reasons for the indication of allowable subject matter

17. Claims 38-47 are allowed.

Please see the office action mailed on 01/29/2007 for an examiner's statement of reasons for allowance.

Conclusion

18. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dipakkumar Gandhi whose telephone number is 571-272-3822. The examiner can normally be reached on 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacques Louis-Jacques can be reached on (571) 272-6962. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Dipakkumar Gandhi
Patent Examiner

/Cynthia Britt/

Primary Examiner
AU 2117 7/3/07